CLAIMS

What is claimed is:

1. A transmitting system comprising:

a processor to process at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams, the multiple time-delayed output beams being spatially distributed and independently phase shifted;

an integration lens to receive the phase modulated output beams and to reintegrate the phase modulated output beams into a single encoded beam with a time series chip sequence; and

an optical fiber to receive the integrated encoded beam from the integration lens and to transmit the integrated encoded beam.

2. A receiving system comprising:

a processor to process the encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams, the multiple time-delayed output beams being spatially distributed and independently phase shifted;

an integration lens to receive the phase-shifted output beams and to reintegrate the phase-shifted output beams into a single decoded beam; and

a photo detector to receive the integrated decoded beam and to generate an output.

3. A transmitting system comprising:

an optical tapped delay line device to process at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams, the optical tapped delay line device having a cavity with front and back surfaces, wherein one of the front and back surfaces of the cavity phase adjusts the phase of the input beam travelling within the cavity;

an integration lens to receive the phase modulated output beams and to reintegrate the phase modulated output beams into a single encoded beam with a time series chip sequence; and

an optical fiber to receive the integrated encoded beam from the integration lens and to transmit the integrated encoded beam.

4. The system of claim 3, wherein the optical tapped delay device includes an etched plate having an etch depth sufficient to produce a desired phase shift through the time delayed output beams.

5. A transmitting system comprising:

an optical tapped delay line device to process at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams;

a phase modulator to independently phase modulate each of the output beams;

an integration lens to receive the phase modulated output beams and to reintegrate the phase modulated output beams into a single encoded beam with a time series chip sequence; and

an optical fiber to receive the integrated encoded beam from the integration lens and to transmit the integrated encoded beam.

6. A receiving system comprising:

an optical tapped delay line device to process encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams;

a phase modulator to independently phase modulate each of the output beams;

an integration lens to receive the phase modulated output beams and to reintegrate the phase modulated output beams into a single decoded beam; and

a photo detector to receive the integrated decoded beam and to generate an output.

7. A receiving system comprising:

an optical tapped delay line device, to process encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams which are independently phase shifted, the optical tapped delay line device having a cavity with front and back surfaces, wherein one of the front and back surfaces of the cavity phase adjusts the phase of the input beam travelling within the cavity;

an integration lens to receive the phase shifted output beams and to reintegrate the phase shifted output beams into a single decoded beam; and

a photo detector to receive the integrated decoded beam and to generate an output.

8. The system of claim 7, wherein the multiple time-delayed output beams are mutually phase-shifted by an etched pattern on one of the front and back surface of the cavity as a function of the at least one frequency of the input beam which is an inverse reverse accumulated order of a corresponding pattern etched on the transmitter.

9. A transmitting method comprising:

processing at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams, the multiple time-delayed output beams being spatially distributed and independently phase shifted;

independently phase modulating each of the output beams;

receiving the phase modulated output beams at an integration lens;

reintegrating the phase modulated output beams into a single encoded beam with a time series chip sequence;

receiving, via an optical fiber, the integrated encoded beam from the integration lens; and

transmitting the integrated encoded beam.

10. A receiving method comprising:

processing encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams, the multiple time-delayed output beams being spatially distributed and independently phase shifted;

receiving, at an integration lens, the phase shifted output beams;

reintegrating the phase shifted output beams into a single decoded beam;

receiving the integrated decoded beam at a photo detector; and

generating an output from the integrated decoded beam.

11. A transmitting method comprising:

processing, with an optical tapped delay line device, at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams, the optical tapped delay line device having a cavity with front and back surfaces, wherein one of the front and back surfaces of the cavity phase adjusts the phase of the input beam travelling within the cavity;

receiving, at an integration lens, the phase modulated output beams;

reintegrating the phase modulated output beams into a single encoded beam with a time series chip sequence;

receiving, at an optical fiber, the integrated encoded beam from the integration lens; and

transmitting the integrated encoded beam.

12. A receiving method comprising:

processing encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams, the multiple time-delayed output beams being spatially distributed;

independently phase modulating each of the output beams;

receiving, at an integration lens, the phase shifted output beams;

reintegrating the phase shifted output beams into a single decoded beam;

receiving the integrated decoded beam at a photo detector; and

generating an output from the integrated decoded beam.

13. A transmitting method comprising:

processing, with an optical tapped delay line device, at least one collimated input beam which has been modulated with a data signal to produce multiple time-delayed output beams;

independently phase modulating each of the output beams;

receiving, at an integration lens, the phase modulated output beams;

reintegrating the phase modulated output beams into a single encoded beam with a time series chip sequence;

receiving, at an optical fiber, the integrated encoded beam from the integration lens; and

transmitting the integrated encoded beam.

14. A receiving method comprising:

processing, with an optical tapped delay line device, encoded collimated light beams received from a transmitter to produce multiple time-delayed output beams which are independently phase shifted, the optical tapped delay line device having a cavity with front and back surfaces, wherein one of the front and back surfaces of the cavity phase adjusts the phase of the input beam travelling within the cavity;

receiving, at an integration lens, the phase shifted output beams;

reintegrating the phase shifted output beams into a single decoded beam;

receiving the integrated decoded beam at a photo detector; and

generating an output from the integrated decoded beam.

15. The system of claim 1, wherein the modulation can be implemented in a spectral domain.

16. The system of claim 2, wherein the modulation can be implemented in a spectral domain.

17. The system of claim 3, wherein the modulation can be implemented in a spectral domain.

18. The system of claim 5, wherein the modulation can be implemented in a spectral domain.

19. The system of claim 6, wherein the modulation can be implemented in a spectral domain.

20. The system of claim 7, wherein the modulation can be implemented in a spectral domain.

21. The system of claim 1, wherein the system can be used with an optical equalizer.

22. The system of claim 2, wherein the system can be used with an optical equalizer.

23. The system of claim 3, wherein the system can be used with an optical equalizer.

24. The system of claim 5, wherein the system can be used with an optical equalizer.

25. The system of claim 6, wherein the system can be used with an optical equalizer.

26. The system of claim 7, wherein the system can be used with an optical equalizer.

27. The system of claim 1, wherein the system can be used in wide-band signal generation.

28. The system of claim 2, wherein the system can be used in wide-band signal generation.

29. The system of claim 3, wherein the system can be used in wide-band signal generation.

30. The system of claim 5, wherein the system can be used in wide-band signal generation.

31. The system of claim 6, wherein the system can be used in wide-band signal generation.

32. The system of claim 7, wherein the system can be used in wide-band signal generation.

33. A receiving system comprising:

an optical tapped delay line device having a cavity to process at least one collimated input beam to produce multiple time delayed spatially distributed output beams in a linear array;

a second input beam which projects at an angle to a plane of the optical tapped delay line linear array to interfere with each optical tapped delay line beam;

a two-dimensional photo detector array arranged to sample the interfering beams; and

an electronic amplifier to sample the two-dimensional photo detector array.

34. The system of claim 33, wherein the optical tapped delay line input beam is modulated with a data signal and the second input beam is a coherent reference.

35. The system of claim 33, wherein the optical tapped delay line input beam is a coherent reference and the second input beam is modulated with a data signal.

36. A receiving system comprising:

an optical tapped delay line device having a cavity to process at least one collimated input beam to produce multiple time delayed spatially distributed output beams in a linear array;

a second optical tapped delay line device having a cavity to process at least one collimated input beam to produce multiple time delayed spatially distributed output beams in a linear array, wherein each optical tapped delay line beam interferes with the corresponding beam of the first optical tapped delay line;

a two-dimensional photo detector array arranged to sample the interfering beams; and

an electronic amplifier to sample the two-dimensional photo detector array.

37. The system of claim 36, wherein output beam to output beam delays propagate in a same direction in the optical tapped delay line device and the second optical tapped delay line device and an output of the receiving system is a correlation of the signals on the input beams.

38. The system of claim 36, wherein output beam to output beam delays propagate in opposite directions in the optical tapped delay line device and the second optical tapped delay line device, and an output of the receiving system is a convolution of the signals on the input beams.